the example of *Nymphaea*, in which the presence of centrosomes has recently been insisted on, Strasburger shows that not only can the occasional granules not be identified as centrosomes, but that the spindle often reaches to and ends on the peripheral layer of the cytoplasm in a multipolar fashion.

Naturally the bodies known as blepharoplasts are also brought under discussion. These structures have by some been identified with centrosomes, but they seem really to be but remotely related to them. The fact that, as was shown by Webber, the true spindle often becomes multipolar, notwithstanding the presence of blepharoplasts, tells strongly against their centrosomic character, whilst the fact that in the earliest stages radiations start from them proves absolutely nothing at all. Fischer has shown how heterogeneous bodies may serve as starting-points for radiations in fixed specimens of albumin; and Guignard has described and figured, in the case of the lily, similar radiations having the entire nucleus as their common centre. Much more definite is the relationship existing between the blepharoplasts and cilia. Strasburger, who regards them as essentially consisting of kinoplasm, adduces a series of observations in support of the view that they, or bodies like them, are constantly associated with cilia. Certainly it is a fact of no small significance that whilst, in ferns and cycads, they should be absent from all the other nuclear divisions, they are constantly present in those which directly lead to the formation of the motile antherozoids. Moreover, R. Hertwig has found an analogous relation to hold good for Actinospherium, stating that "centrosomes" only occur in connection with the polar (*Richtungs*) mitoses, whilst they are quite absent from the somatic divisions.

It is not possible to touch, even briefly, on all the points raised and illustrated in Prof. Strasburger's book; it is hoped, however, that enough has been said to indicate its importance as embodying, not only a considerable number of new facts, but also many new and suggestive points of view.

And throughout the volume one is struck, not only by the full recognition accorded to the work of other investigators in the same field, but by the invariable courtesy which characterises the author's criticism of their results even when these do not accord with those obtained by himself. J. B. FARMER.

MODERN POWER LOOMS.

Mechanism of Weaving. By T. W. Fox. Pp. xxii + 514. (London: Macmillan and Co., Ltd., 1900.)

THE second edition of this excellent book, on the construction and working of the power loom, has been carefully revised by the author. It has justly been recognised as a standard text-book on the subject of loom mechanism. The work treats of tappet, dobbie, and Jacquard or harness looms. In the first place, a full exposition is given of the tappet shedding motion, reference being made to the Yorkshire tappet loom, Woodcroft and segment tappets, and also to the different under motions for the depression of the heald shafts. Proceeding, Mr. Fox deals with some of the principal types of dobbies, such as the Blackburn, Keighley, Burnley and American. By means of sectional drawings, the somewhat intricate mechanism of these dobbies is clearly described. The work would have been enhanced to the manufacturer of heavy fabrics, such as linen, woollen and worsted textures, if fuller descriptions had been given of the dobbies employed in the weaving of these fabrics. Still, to the student of cotton weaving and the manufacturer of light fabrics, the information supplied will be found invaluable, and even the makers of heavier cloths might consult the pages on dobbies with profit. It is open to dispute whether the best method of treatment has been adopted, from a student's standpoint, in dealing fully with shedding motions, including the Jacquard, and card stamping, and the methods of tieing up the harness, before reference is made to other essential motions of the loom; but the plan of the author is evident on only a casual examination of the book, namely, to treat of each distinct motion in all its various forms in succession, excluding the possibility of affording the reader at the outset even a general notion of the combination of movements in power-loom weaving. This explains why some 280 pages, or more than half the book, should be devoted to the principles of shedding, card stamping and harness mounting, prior to any descriptive reference being made to the picking, the warp let-off, fabric take-up, shuttle, and other motions.

In dealing with the Jacquard loom, the single-lift machine—the basis on which all Jacquards are constructed—is first treated of; then follow descriptions of the double-lift, centre-shed, open-shed, twilling, Bessbrooke and cross-border machines. The doup and gauze harness are very clearly explained. Other systems of tie-up, more elaborately illustrated, might have been advantageously incorporated into this section of the work; but sufficient data is afforded to enable the student to grasp the principles on which the complex mountings are effected, necessary in the weaving of tapestry and decorative silk fabrics.

Lappet weaving receives adequate attention, especially as worked by means of lappet wheels and the Scotch method; but only brief details are given on other forms of this motion, in which lags are used and pegs of different lengths, and also in which the frames for carrying the lappet threads operate on the upper side of the fabric.

In regard to picking, Mr. Fox gives some interesting information on the magnitude of the force expended in propelling the shuttle from side to side of the loom. Perhaps there is no motion in weaving in which improvement is so desirable as in picking. This is more obvious in heavy looms, where large shuttles have to be used, travelling at a high speed. Under the head of "Warp Protectors," fast and loose reeds are considered, as well as shuttle guards. Many attempts have been made at automatic warp-stop motions, such as those applied to the Northrop and Poyser looms, but probably the author has not mentioned these on account of their not having come into general use in this country; still, there are principles in both interesting to the student of "Mechanism of Weaving."

The chapter on "Multiple Box Motions" is one very typical of the author's skill in the exposition of difficult mechanical problems. Revolving, as well as drop-box

motions, with suitable illustrations, are fully explained. On "beating-up," the author has some instructive information respecting the movement of the crank for carrying the batten or going part against the fell of the fabric. He supplies a table showing the motion of the crank, and treats of the length of the crank-arm and the eccentricity of movement. The concluding portions of the book are devoted to weft-stop motions, mechanism for governing the warp and taking-up of the fabric, the construction of temples and selvage motions. There is also a chapter on the arrangement of weaving-rooms or sheds, with a plate illustrative of the positions of the looms and other machinery. The book should be in the possession of all those interested in the construction of power looms.

OUR BOOK SHELF.

Leçons d'Optique géométrique à l'Usage des Élèves de Mathématiques spéciales. Par E. Wallon, Professeur au Lycée Janson-de-Sailly. Pp. 343. (Paris: Gauthier-Villars, 1900.)

THIS book has been written at the desire of Prof. Wallon's students, to whom a graceful tribute is paid, in the preface, for the assistance which their questions, doubts and objections have rendered in developing the author's methods of teaching. To look on one's students as collaborators, that is certainly the secret of successful teaching; and, as here presented, Prof. Wallon's lectures are certainly successful in giving a systematic and clearly defined outline to the science of geometrical optics. The diagrams are well drawn and numerous, and the mathematical proofs are simple and yet sufficient. There is, however, little that is novel to be found in the course of these lectures; indeed, in a few cases it might be objected that there was a tendency to lag behind the times. Thus, in discussing refraction equivalents, Newton's law, that $\frac{n^2-1}{d}$ = constant, and Gladstone and Dale's law, that $\frac{n-1}{d}$ = constant, are alone mentioned (n being the refractive index, and d the density of the substance). Lorenz's law, that $\frac{n^2-1}{(n^2+2)d}$ = constant, is now most generally accepted. For gases, in which n is nearly equal to unity, all three laws hold with about equal accuracy. But Lorenz's law appears to hold in passing from the gaseous to the liquid state, and must therefore be accepted as the most general.

An interesting chapter is devoted to the subject of the human eye, in which the most well known optical properties of that organ are discussed. In the ensuing chapter, on optical instruments, a particularly good account is given of the optical systems comprised in telescopes and microscopes of various patterns. It is surprising, however, that the ophthalmoscope and ophthalmometer are not mentioned, and are in fact so seldom found described in works on geometrical optics. Both instruments involve interesting optical arrangements, and their practical usefulness would render a description of their details still more interesting. E. E.

Therapeutic Electricity and Practical Muscle Testing. By W. S. Hedley, M.D., M.R.C.S. England. Pp. ix + 278; 3 plates; 99 illustrations. (London: J. and A. Churchill, 1899.)

THE increased use of electro-therapeutic methods renders the appearance of Dr. Hedley's book welcome. The profession have for some time looked somewhat askance at this departure in therapeutics, and are, in many branches of this practice, rather inclined to regard the good effect of the treatment as moral and not actual. The work before us considers the whole subject from a scientific standpoint, and any one interested in it will gain considerable profit from its perusal.

The reader must be warned at once that the book contains no mention of radiography or the application of the Röntgen rays to the healing art, either from a diagnostic or therapeutic standpoint. The author, in his preface, admits that the work is a therapeutical one, and to some extent apologises for the description of such instruments as the cystoscope, &c. No doubt he thinks the profession is in possession of sufficient literature upon the subject of radiography, which may or may not be true; the sphere of usefulness of the book would, however, certainly have been increased by the inclusion of this subject.

The work is divided into three parts. The reason for this classification is not quite evident; a part as a classification unit seems, in the author's hands, to differ to no material extent from a chapter. Further, each part is chaptered separately, which, without some very special object is to be gained, is a bad plan; from this it follows that the book contains three Chapters i., &c.

The first part is mostly concerned with those general physical considerations which have a special bearing upon what the author in the first chapter of Part ii. calls the electro-therapeutic outfit. A good account is given in Chapter vii. (p. 65) of currents of great frequency and high potential, which, as has been frequently shown, are of great therapeutic value. Much technical detail is given, both of a purely electrical and electro-physiological character.

One of the most useful chapters from the standpoint of the general physician is Chapter v. Part ii., upon the action of muscles and the consequences of their paralysis. In Chapter x. Part iii., an interesting account of cataphoresis is given. Very frequent mention is made of authors' names and no reference added, nor is there an index of authors at the end, or anything in the shape of a bibliography. Mere chance or whim has apparently guided the author in giving or omitting the full reference of a work cited; in some cases the full reference of important monographs is withheld, in others that of trivial ones given. This method cannot be too severely deprecated.

To sum up our remarks, it is with the manner and not the matter of the book we find fault. It is full of useful and, indeed, essential information to those working in this field; the author has spared no pains to collect fact bearing upon and elucidating his subject.

Lessons in Botany. By Prof. George F. Atkinson, Ph.B. Pp. xv+365. (New York: Henry Holt and Co., 1900.)

THE present volume is, in a sense, an abridged edition of an excellent text-book by the same author, which appeared a year or two ago. The subject-matter is carefully arranged to suit the convenience of teacher and pupil, and altogether the book is one which should prove useful in this country as well as in America. Naturally, from the British point of view, the difficulty of obtaining the needful specimens occasionally may turn up, though this would not recur very often. We can confidently recommend Prof. Atkinson's book to the notice of teachers.

Outlines of Plant Life, with special reference to Form and Function. By Prof. Charles Reid Barnes. Pp. vi+308. (New York: Henry Holt and Co., 1900.)

THIS is a work intended for school use. It has some points of merit, especially the special part on ecology, in which the examples are well chosen and fully illustrated. The illustrations, though almost all are (with due acknowledgment) borrowed from other works, are distinctly good. We think the book a useful one, and the exercises which are interspersed through the volume add to its value.